

# Metabolic Syndrome and Hypertension in Diabetic Nephropathy Patients in Rural Goa, India

Mohan Vinoth<sup>1</sup>, Nadia Rangel Pinto<sup>2</sup>, Agnelo Ferreira<sup>3</sup>, Frederick Vaz<sup>2</sup>, Manoj Kulkarni<sup>4</sup>

## ABSTRACT

**Introduction:** In India, longer duration of Diabetes increases the probability of patients developing hypertension, atherosclerotic plaques and nephropathy. So this study aims to analyze the association of Metabolic Syndrome BMI and Hypertension with Diabetic Nephropathy.

**Material and Methods:** All diabetic patients treated at a primary care level center in Goa, India in the first quarter of 2013 were assessed for Nephropathy based on microalbuminuria and retinopathy positivity. Obesity (BMI), Hypertension, and Metabolic syndrome was assessed in the study subjects and their association with Nephropathy was studied. Statistical analysis by SPSS version 22 using Fisher's Exact test and t test.

**Results:** Nephropathy was seen in 42 Diabetes patients (17.4%). Nephropathy was diagnosed in 21.22% patients with metabolic syndrome and 6.45 % patients without metabolic syndrome (p=0.006). In diabetics with hypertension 21.1% had nephropathy while nephropathy was present only in 2.1% of non-hypertensive patients (p=0.001). The mean systolic blood pressure in nephropathy patients was 148.95mm Hg (SD ± 16.26), p=0.0001. Nephropathy patients had a mean diastolic blood pressure of 85.66 mm Hg (SD ±9.72), p=0.0001.

**Conclusions:** Metabolic syndrome, higher levels of systolic and diastolic blood pressure and established hypertension were significantly associated with diabetic nephropathy. Diagnosing metabolic syndrome and hypertension early among diabetics in rural areas is imperative to initiate appropriate therapy to avert and retard the progression of nephropathy.

**Keywords:** Diabetic Nephropathy, Metabolic syndrome, Obesity, Hypertension

## INTRODUCTION

Nephropathy in India is envisioned to impact approximately 6.6 million.<sup>1</sup> Numerous studies worldwide and in India have revealed that prevalence of Nephropathy among Diabetes patients varies from 13% to 70.8%.<sup>2-4</sup> In the Fearless forecast of the Eighth Joint National Committee, attention has been drawn to the triad of hypertension, diabetes and chronic kidney disease. Hypertension is one of the pertinent factors raising the probability of cardiovascular morbidity and mortality in diabetic patients.<sup>5</sup>

In diabetics, blood pressure steadily and progressively begins to escalate. As gross proteinuria is detected, a majority of patients with type II diabetes have established hypertension.<sup>5</sup> Chronic Kidney Disease is attributed to Diabetes if there is macroalbuminuria or a combination of retinopathy with microalbuminuria according to the guidelines of National Kidney foundation. Uncontrolled blood pressure levels in diabetic patients further exacerbates this risk.<sup>6</sup>

When Diabetes and Hypertension coexist, arterial intimal calcification appears in atherosclerotic plaques.<sup>7</sup> Metabolic

Syndrome is an early indicator of this occurring, gradually progressing to diabetes, hypertension and consequent cardiovascular morbidity. In India, with a precipitous escalation in metabolic syndrome and dramatically pronounced diabetes, the risk of complications like nephropathy is likely to increase.

This study aims to analyze the association of Metabolic Syndrome BMI and Hypertension with Diabetic Nephropathy.

## MATERIAL AND METHODS

A study of all the rural diabetes cases treated at a primary care level center of the Department of Preventive and Social Medicine, Goa Medical College Goa, India was conducted in the first quarter of 2013. The study subjects were two hundred and forty one. The Institutional Ethics Committee of Goa Medical College approved the study in October 2012. Patients after informed consent were examined and investigated for diabetic nephropathy based on criteria that comprised of microalbuminuria with presence of retinopathy or just clinical albuminuria. Urine albumin creatinine ratio between 30µg/mg to 300µg/mg creatinine was considered positive for microalbuminuria and above 300µg/mg creatinine was considered clinical albuminuria (National Kidney Foundation- Kidney Disease Outcome Quality Initiative Guidelines) and retinopathy was detected by ophthalmoscopy as per Early diagnosis and treatment of Retinopathy study classification.

The data obtained was waist circumference in cm, weight in Kg and height in meters and BMI calculated. Blood pressure was measured with a mercury Sphygmomanometer. All patients were subjected to testing of blood sugar and lipid levels and assessed for the presence of Metabolic syndrome by National Cholesterol Education Program Adult Treatment Panel ATP III guidelines.

BMI was classified based on the Joint report by ICMR and Ministry of Health and Family welfare department of India 2008. "Consensus statement for the diagnosis of Obesity, Abdominal Obesity, and Metabolic syndrome for Asian Indians and Recommendations for Physical Activity, Medical and Surgical Management".

<sup>1</sup>Junior Consultant, Directorate of Health Services, <sup>2</sup>Assistant Professor, <sup>3</sup>Director Professor, <sup>4</sup>Associate Professor, Department of Preventive and Social Medicine, Goa Medical College, Government of Goa, Goa, India

**Corresponding author:** Nadia Rangel Pinto, 4E/FO-1 Models Millennium, Caranzalem Tiswadi, Goa India 403002.

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Hypertension was diagnosed in subjects whose systolic blood pressure is 140 mm Hg and /or diastolic blood pressure is 90 mm Hg.

**STATISTICAL ANALYSIS**

SPSS Version 22 was used for statistical analysis. Means and proportion were used to express data and comparison assessed by t test and Fisher’s exact test.

**RESULTS**

The participants in this study included two hundred and forty one diabetic patients availing treatment at a primary care level center of the Department of Preventive and Social Medicine, Goa Medical College, Goa India.

Diabetic Nephropathy was present in 42 study subjects (i.e. 17.4%). Metabolic syndrome was present among 129 diabetic patients (74. 27%). Of the patients with metabolic syndrome, 21.22% had Diabetic nephropathy while nephropathy was present in 6.45% of those without metabolic syndrome (p = 0.006).

Mean waist circumference of patients with Diabetic Nephropathy was 91.4 cm (SD ±10.8) while it was 91.32 (SD ±10.34) in those without nephropathy. p=0.573. Nephropathy was found in 26.9% of those with normal weight compared to 14.2% patients with a BMI of more than 23kg/m<sup>2</sup>.

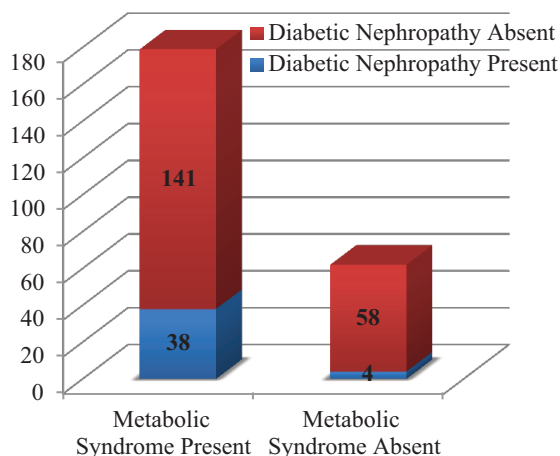
(p = 0.0707)

In Diabetics with hypertension 21.1% had nephropathy compared to 2.1% of non-hypertensive patients (p=0.001). The mean systolic blood pressure among diabetic nephropathy patients was 148.95mm Hg (SD±16.26) the mean diastolic blood pressure was 85.66 mm Hg (SD±9.72). While in patients without nephropathy mean systolic BP was 128.19 (SD±12.54) mm Hg and mean diastolic BP was 80.04 mm Hg (SD±7.22).

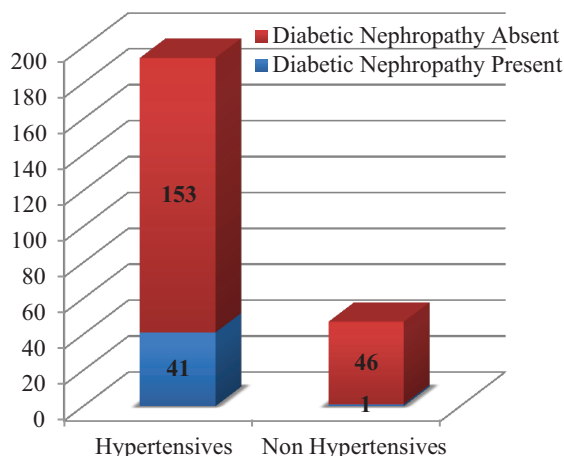
**DISCUSSION**

Metabolic syndrome was present among 74.27% diabetic patients. This study revealed that in patients with Metabolic syndrome 21.22% had Diabetic nephropathy while nephropathy was present in 6.45% of those without metabolic syndrome (p = 0.006). This strengthened the claim made in a study by Palaniappan et al in which Metabolic syndrome and hypertension verified the convincing association with microalbuminuria in both females OR =3.34; 95% (CI 2.45-4.55) and males OR= 2.51; 95% (CI 1.63- 3.86).<sup>8</sup>

Mean waist circumference of patients with Diabetic Nephropathy was 91.4 cm (SD ±10.8) while it was 91.32 (SD ±10.34) in those without nephropathy. p=0.573. Waist circumference was not independently significantly associated with Diabetic Nephropathy but when combined with other criteria and



**Figure-1:** Diabetic Nephropathy and Metabolic Syndrome



**Figure-2:** Diabetic Nephropathy and Hypertension

Characteristic	Diabetic Nephropathy present	Diabetic Nephropathy absent	Test	P value
Mean systolic BP blood pressure mm Hg	148.95 (SD 16.26)	128.19 (SD 12.54)	t test	0.001
Mean diastolic blood pressure mm Hg	85.66 (SD 9.72)	80.04 (SD 7.22)	t test	0.001
Mean waist circumference Cm	91.64 (SD 10.8)	91.32 (SD 10.34)	t test	0.573
Metabolic syndrome present	38 (21.22 %)	141 (78.78%)	Fisher’s test	0.006
Metabolic syndrome absent	4 (6.45 %)	58 (93.55 %)		
Total	42 (17.4 %)	199 (82.6 %)		
Hypertension present	41 (21.1 %)	153 (78.9%)	Fisher’s test	0.001
Hypertension absent	1 (2.1%)	46 (97.9%)		
Total	42 (17.4%)	199 (82.6%)		
BMI <18.5 kg/ m <sup>2</sup>	1 (10%)	9 (90%)	Fisher’s test	0.0707
BMI 18.5 – 22.9kg/m <sup>2</sup>	18 (26.9%)	51 (73.1%)		
BMI 23 Kg/m <sup>2</sup> and above	23 (14.2%)	139 (85.8%)		
Total	42 (17.4 %)	199 (82.6%)		

**Table-1:** Characteristics associated with Diabetic Nephropathy

patient categorized as metabolic syndrome there was significant association with nephropathy observed. Chang Sheng Sheng et al in Shanghai also found that microalbuminuria was not significantly associated with independent waist circumference element of metabolic syndrome.<sup>9</sup>

Our study finding thus implies that the presence of metabolic syndrome among diabetics is an important predictor of nephropathy.

The presence of nephropathy in 26.9% of those with normal weight compared to 14.2% patients with a BMI of more than 23kg/m<sup>2</sup>. (p = 0.0707) in this study was similar to the evidence from patients from 26 countries by Martin Theones Jan- Christian Reil et al (2009), it was found that BMI was not associated with microalbuminuria. Another study confirms this finding.<sup>10</sup>

In Diabetics with hypertension 21.1% had nephropathy compared to 2.1% of non-hypertensive patients (p=0.001). The mean systolic blood pressure among diabetic nephropathy patients was 148.95mm Hg (SD± 16.26) the mean diastolic blood pressure was 85.66 mm Hg (SD± 9.72). While among patients without nephropathy mean systolic BP was 128.19 (SD±12.54) mm Hg and mean diastolic BP was 80.04 mm Hg (SD±7.22).

The International Society of Nephrology Kidney disease improving global outcome revealed that the presence of uncontrolled blood pressure in diabetic patients strengthens the risk of association with nephropathy.<sup>11</sup> Analysis by Ranjit Unnikrishnan et al in 2006 (CURES 45) revealed that in diabetics, systolic blood pressure (p=0.001) and diastolic blood pressure (p=0.022) were significantly associated with microalbuminuria.<sup>2</sup>

## CONCLUSIONS

This study revealed that metabolic syndrome and hypertension were significantly associated with diabetic nephropathy. Higher levels of systolic blood pressure and diastolic blood pressure were significantly associated with nephropathy.

However, BMI did not reveal such an association with nephropathy.

Screening for metabolic syndrome, early diagnosis of hypertension and regular monitoring of blood pressure among diabetics is imperative to initiate appropriate therapy to retard its progression to nephropathy particularly in rural India where dialysis availability is limited thus averting a renal catastrophe of far reaching dimensions.

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